Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Period:\_\_\_\_\_\_

**Mark and Recapture Population Size Estimation Activity**

Thank you Ms. Glick!

**Background:** Population genetics is the study of the genetic structure of populations, the frequencies of alleles and genotypes. A population is a local group of organisms of the same species that normally interbreed. All of the alleles shared by all of the individuals in a population make up the population's gene pool. The most fundamental task in population ecology is to determine or estimate population size.

One way to estimate the size of a population is to capture and mark individuals from the population, release them, and then resample to see what fraction of the individuals carry marks. Various techniques with accompanying equations are then used to approximate population size.

**Objective:** You will be expected to estimate the size of a sample population using the mark-recapture technique.  Be able to apply the technique to new population problems and estimate population size from sample data.

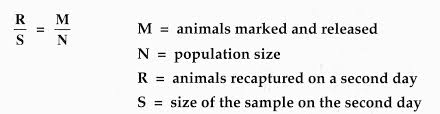
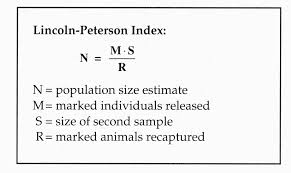
**Mark and Recapture Procedure:** In this procedure, biologists use traps to capture the animals alive and mark them in some way.  The animals are returned unharmed to their environment.  Over a long time period, the animals from the population are continued to be trapped and data is taken on how many are captured with tags.  A mathematical formula is then used to estimate population size.

1. You will receive a bag containing paper squares that represents your population of animals.
2. Capture 10 “animals” by removing them randomly from the bag.
3. Place a small mark on the corner of the square using the color pencil specified by your teacher. These represent the original marked animals in your population. You do not need to record this on your table.
4. Return the 10 marked “animals” to the bag
5. With your eyes closed, select 5 “animals” from the bag one at a time. Do not put the paper square back into the bag until after all 5 animals have been chosen. This is the **recapture** step. Record the number of “animals” recaptured for Trial 1 in the chart. This should be the number in your 5-animal sample that have been marked already from your 10-animal original sample.
6. Return the “animals” to the bag.
7. Repeat steps 5 & 6 (the recapturing portion) five times. However, in each of these trials, the number that you recapture will be different. For example in trial two, you will be recapturing 10 animals and trial three will be 15 animals (continue this processes following the data table below).

**Data Table**

|  |  |  |
| --- | --- | --- |
| Trial Number | Number Captured | Number Recaptured with Mark |
| 1 | 5 |  |
| 2 | 10 |  |
| 3 | 15 |  |
| 4 | 25 |  |
| 5 | 40 |  |
| 6 | 60 |  |

**Questions and Calculations:** In order to estimate your population size, use the Lincoln-Peterson Index below:



Can be rearranged to create this

|  |  |  |
| --- | --- | --- |
| Trial Number | Work | Estimation |
| 1 |  |  |
| 2 |  |  |
| 3 |  |  |
| 4 |  |  |
| 5 |  |  |
| 6 |  |  |

Once you have completed your estimation see your teacher to determine how many animals were actually in your population.

1. Compare the actual size to the estimated size at each trial. Did you usually overestimate/underestimate?
2. What does your data tell you about how the size of a recapture effects your population estimation?
3. A biology class originally marked 40 butterflies in the butterfly garden at Osbourn Park High School.  Over a month long period ­ butterfly traps caught 200 butterflies.  Of those 200, 8 were found to have tags.  Based on this information, what is the estimated population size of the butterflies in the butterfly garden?

1. In what situations would mark & recapture work best and in what type of situations would a different method work better?

*\*\*\*When you have finished, return all “animals” (i.e. paper squares) to the bag. Return your bag.\*\*\**